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A new species of *Ypsolopha* Latreille (Lepidoptera, Ypsolophidae) from the Andes of northern Chile

Héctor A. Vargas[1]

1 *Departamento de Recursos Ambientales, Facultad de Ciencias Agronómicas, Universidad de Tarapacá, Casilla 6-D, Arica, Chile, havargas@uta.cl, lepvargas@gmail.com*

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Abstract. Male and female adults of *Ypsolopha moltenii* **sp. n.** (Lepidoptera, Ypsolophidae) are described and illustrated from the western slopes of the Andes of northern Chile. Larvae of *Y. moltenii* feed on inflorescences of the native shrub *Adesmia verrucosa* Meyen (Fabaceae). This finding represent the first species of *Ypsolopha* Latreille, 1796 described from mainland Chile and the first species of this genus with larvae feeding on the highly diverse South American genus *Adesmia*.

Introduction

Ypsolophidae (Lepidoptera, Yponomeutoidea) is a worldwide micromoth family with more than 160 species described (van Nieukerken et al. 2011), whose monophyly has been supported in morphological (Kyrki 1990) and molecular (Sohn et al. 2013) studies. The widespread *Ypsolopha* Latreille, 1796 is the most diverse of the Ypsolophidae genera with more than 130 species described (Jin et al. 2013; Ponomarenko and Zinchenko 2013). Contrasting with the high species diversity of this genus in the Northern Hemisphere (e.g.: Sohn et al. 2010; Na et al. 2016), only seven species are known from the Neotropical region (Heppner 1984): five from Argentina, one from Peru and one from Chile.

The only Chilean representative of *Ypsolopha*, *Y. telluris* (Clarke, 1965), is endemic to the Juan Fernandez Islands (Clarke 1965); species of this genus have been not recorded from the mainland part of this country. The aim of this study is to describe and illustrate the first species of *Ypsolopha* from mainland Chile, recently discovered in a high elevation arid environment of the Andes in the northernmost part of this country.

Material and methods

The specimens used in this study were collected as larvae on inflorescences of the native shrub *Adesmia verrucosa* (Fabaceae) close to Socoroma village at about 3200 m elevation on the western slopes of the Andes of northern Chile (Figs 1–4), between May 2017 and April 2018. The collected

Figures 1–4. Habitat and host plant of *Ypsolpha moltenii* in the type locality. **1.** Habitat of *Y. moltenii* close the Socoroma village, Arica Province, northern Chile, at about 3200 m elevation on the western slopes of the Andes. **2.** A shrub of *Adesmia verrucosa*, the host plant of *Y. moltenii*. **3.** Detail of a flower of *A. verrucosa*. **4.** Fruits of *A. verrucosa*.

larvae were placed in plastic vials and brought to the laboratory. Additional inflorescences were provided periodically until larvae finished feeding and pupated. Adults were mounted and their abdomens were dissected following standard procedures. The genitalia were stained with Eosin

Y or Chlorazol black, and subsequently slide mounted with Euparal. Morphological observations were performed with a Leica M125 stereomicroscope and an Olympus BX51 optical microscope. Images were captured with a Sony CyberShot DSC-HX200V digital camera.

Abbreviations of institutional collections

MNNC Museo Nacional de Historia Natural de Santiago, Santiago, Chile

IDEA Colección Entomológica de la Universidad de Tarapacá, Arica, Chile

Results

Ypsolopha moltenii sp. n.

http://zoobank.org/87E8604D-785E-45CA-9423-178F77D1C932

Figs 5–9

Type material. Holotype, ♂, CHILE: Socoroma, Parinacota, Chile, May 2018, H.A. Vargas coll., ex-larva on *Adesmia verrucosa*, April 2018 (MNNC).

Paratypes, CHILE: 1 ♂, 1 ♀, same data as holotype (MNNC); two ♂♂, same data as holotype (IDEA); 1 ♂, 5 ♀♀,, Socoroma, Parinacota, Chile, June 2017, H.A. Vargas coll., ex-larva on *Adesmia verrucosa*, May 2017 (IDEA).

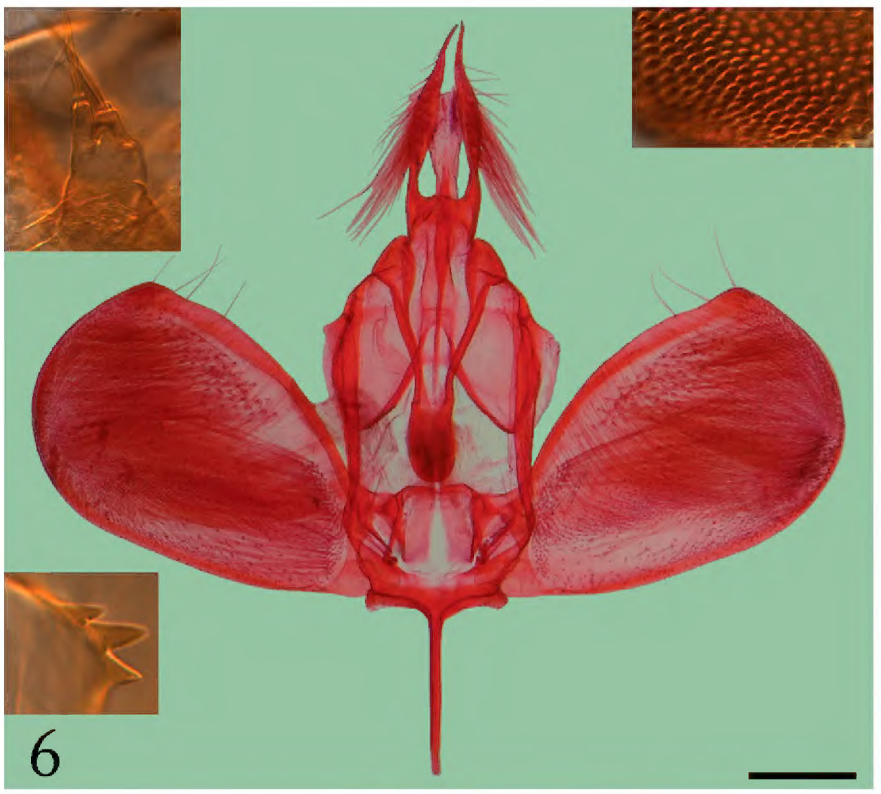
Diagnosis. The male genitalia of *Y. moltenii* are remarkably similar to those of *Y. hydraea* (Meyrick, 1919), described from Oroya, Junin Department, on the western slopes of the Andes of central Peru; however, the knob on the costal margin of the valva of *Y. moltenii* enables its separation from *H. hydraea*. The male genitalia of the only other Chilean *Ypsolopha*, *Y. telluris*, also resemble *Y. moltenii*; however, the saccus of *Y. telluris* is about a half the length of a socius, whereas, these structures are about the same length in *Y. moltenii*; in addition, the aedeagus is strongly curved along the distal half and the vesica has three similar sized cornuti in *Y. telluris*, whereas the aedeagus is slightly curved at middle and the vesica has a single narrow cornutus in *Y. moltenii*. As the female genitalia of *Y. hydraea* and *Y. telluris* remain unknown, it is not possible to provide comparisons of these with *Y. moltenii*.

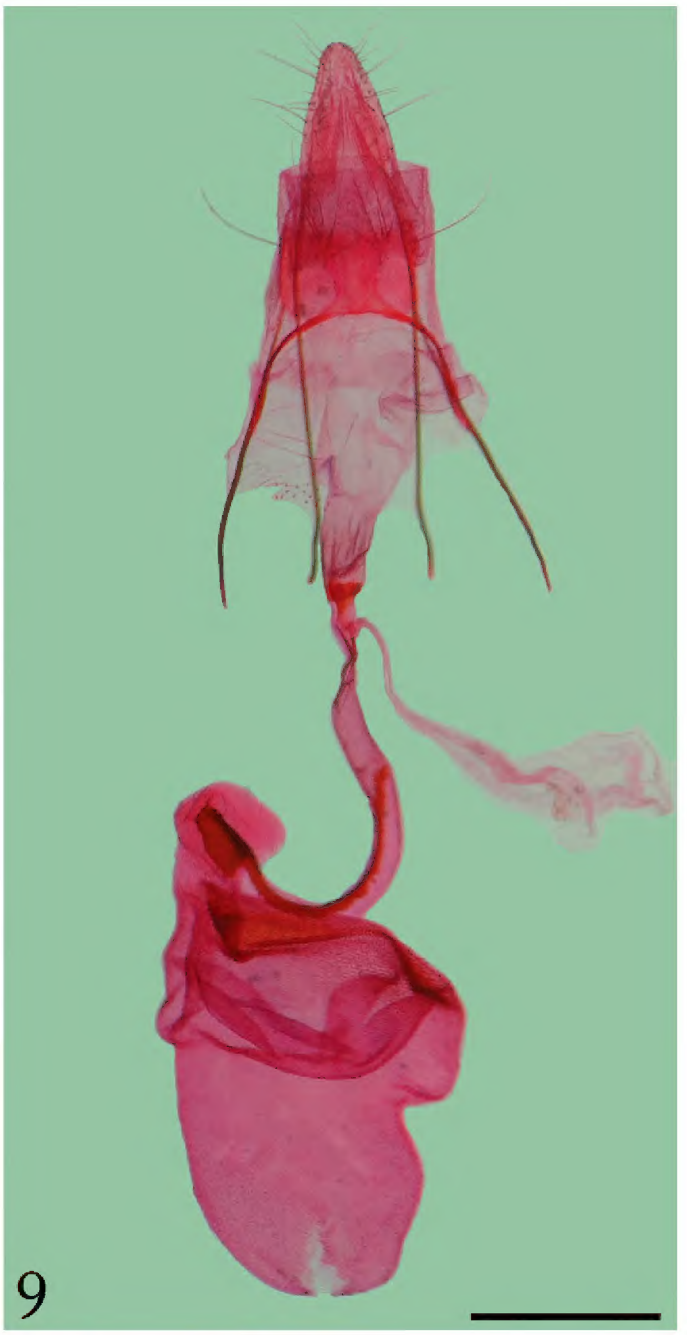
Male (Figs 5–8). Forewing length 9–10.1 mm.

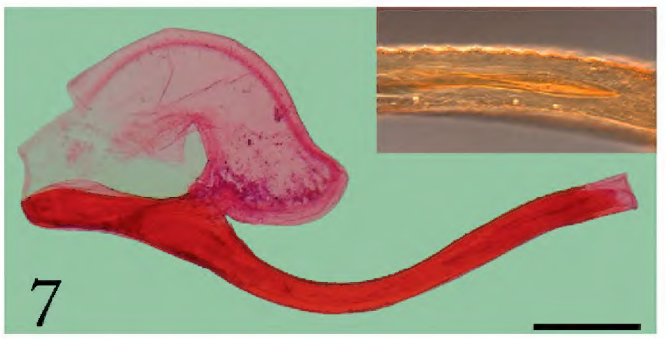
Head. Frons with smooth dark gray scales; vertex mostly with whitish gray elongated narrow scales, a few dark gray scales scattered. Maxillary palpus creamy white. Labial palpus mostly dark gray; second segment mostly creamy white on inner face, dark gray scales of second segment projected beyond half of third segment. Antenna dark gray with a few lighter scales scattered. Circular ocellus postero-lateral to the scape base, close to compound eye margin.

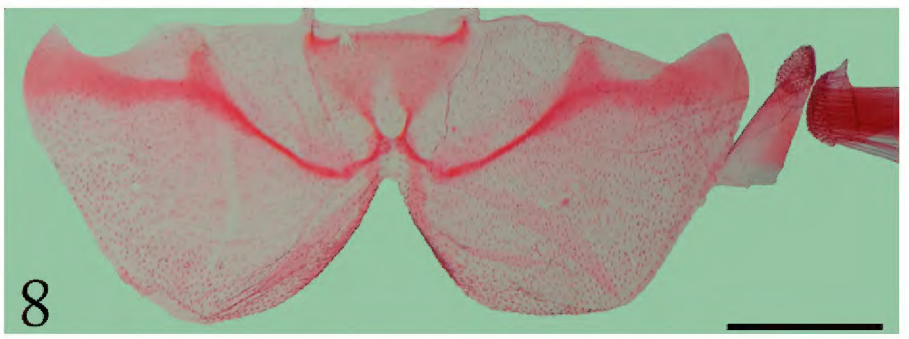
Thorax. Dark gray dorsally, whitish gray laterally. Foreleg mostly dark gray with whitish gray scales intermixed, tibial epiphysis dark gray. Midleg with dark and whitish gray scales intermixed, tibial spurs dark gray. Hindleg mostly with whitish gray scales with a few dark gray scales scattered, tibial spurs whitish gray. Forewing mostly dark gray with a few light brown, creamy white and light gray scales scattered. Hindwing uniformly whitish gray, fringe in two parts, a stripe of short whitish gray scales and a stripe of longer (about 3 times the length of the shorter ones) creamy white scales.

Abdomen. Mostly dark gray with whitish gray scales intermixed. Segment VIII (Fig. 8): tergum triangular, with a pair of sclerotized posterior projections encircling the base of pleural lobes; sternum mostly membranous, with a pair of coremata, each arising from a circular area.









Figures 5–9. Adult stage of *Ypsolopha moltenii*. **5.** Male in dorsal view, holotype. **6.** Male genitalia in ventral view; upper left rectangle: detail of the inner face of the base of the left valva close to the costal margin showing a cylindrical projection with hair-shaped scales at apex; upper right rectangle: detail of the coarse surface of the ventral arm of the gnathos; bottom left rectangle: detail of the inner face of the base of the left valva close to the ventral margin showing a saw-shaped projection with three teeth. **7.** Aedeagus in lateral view; upper right rectangle: detail of the subapical part of the aedeagus showing waved dorsal surface and cornutus. **8.** Male abdominal segment VIII, coremata close to right margin. **9.** Female genitalia in ventral view. Scale bars 5, 0.25, 0.25, 0.5, 0.5 mm, respectively.

Male genitalia (Fig. 6). Tegumen with anterior margin deeply excavated at middle. Socius digitate, pointed apex, hair-like scales on the medial third. Gnathos Y-shaped; ventral arm widened, coarse, round apex, length about half the dorsal arms. Saccus narrow, similar length to socius.

Anellus in two narrow triangular sclerotized plates separated by a membranous area. Valva ovate, medial third widened, distal margin round, a small knob on the apex of the costal margin, external and inner faces with hair-like scales, basal part of inner face with a short cylindrical projection with 3–5 apical hair-shaped scales close to costal margin and a saw-shaped projection (3–5 teeth) close to ventral margin. Aedeagus (Fig. 7) cylindrical, slightly ventrally curved at middle, dorsal surface slightly waved along distal third; vesica with a single arrow-shaped cornutus.

Female. Similar to male in maculation and size. Eighth segment of the abdomen not modified as in male.

Female genitalia (Fig. 9). Papillae analis narrow, elongated, slightly sclerotized, with hair-like setae. Posterior apophysis spine-shaped, about three times the length of papillae analis. Anterior apophysis spine-shaped, about 2/3 the length of posterior apophysis, base bifurcated, dorsal arm continuous with tergum VIII, ventral arm continuous with sternum VIII. Sternum VIII trapezoid with lateral margins widely excavated close to the anterior margin, elongated hair-like setae on posterior vertices. Antrum membranous, cone-shaped, with a narrow sclerotized ring distally. Ductus bursae membranous, coiled, a narrow sclerotized patch on distal two thirds. Corpus bursae membranous, pear-shaped, slightly longer than ductus bursae, an elongated signum on the basal half of the right side, slightly widened on tips. Ductus seminalis at base of ductus bursae.

Geographic distribution. *Ypsolopha moltenii* is currently known only from the type locality: Socoroma, Parinacota Province of northern Chile.

Host plant (Figs 1–4). The only host plant currently known for *Y. moltenii* is the native shrub *A. verrucosa*, upon which the larvae were found in silk webs on inflorescences feeding on buds, flowers and unripe fruits.

Etymology. The name of the species is dedicated to my Italian friend Agostino Molteni, for his admiration of the mountain landscapes of the Chilean Andes.

Discussion

Although the highest species diversity of Ypsolophidae is currently known from the Northern Hemisphere, Sohn et al. (2013) suggested that the Neotropical species diversity of this family has been significantly underestimated. This suggestion is partially confirmed with the discovery of *Y. moltenii*, the first species of *Ypsolopha* described from mainland Chile. This finding also highlights the importance of surveying for larvae of Lepidoptera feeding on plants native to these little explored arid environments. The same approach has enabled the discovery of host-specialized representatives of micromoth genera and families previously unknown in Chile (e.g. Pereira et al. 2017; Brito and Vargas 2018).

Larvae of *Ypsolopha* can be found in silk webs on leaves of a wide range of plants (Dugdale et al. 1998), including representatives of the families Betulaceae, Berberidaceae, Caprifoliaceae, Celastraceae, Ephedraceae, Fabaceae, Fagaceae, Myricaceae, Pinaceae, Rosaceae, Salicaceae, Sapindaceae and Ulmaceae (Anikin et al. 2006; Robinson et al. 2010; Jin et al. 2013). *Ypsolopha moltenii* is the first Neotropical species of the genus with larvae feeding on Fabaceae. The larvae of the Palearctic *Ypsolopha sarmaticella* (Rebel, 1917) have been reared from two species of *Caragana* (Fabaceae) (Anikin et al. 2006). The geographic range of the host plant of *Y. moltenii*, *A. verrucosa*, is restricted to the northernmost part of Chile and southern Peru, where it is found on a narrow belt at about 3000–3800 m elevation (Macbride 1943; Trivelli and Valdivia 2009). Recently

Gatica-Castro et al. (2015) have suggested the Vulnerable status for this shrub in its Chilean range. Accordingly, as larvae of *Y. moltenii* feed on reproductive parts of *A. verrucosa*, further studies should be performed to assess the effect of the feeding by the larvae of this micromoth on the reproductive biology of its host plant.

The South American genus *Adesmia* currently includes about 240 described species (Ulibarri and Burkart 2000), 130 of which are represented in Chile (Muñoz-Schick et al. 2016). Further sampling should be performed on additional species of *Adesmia* growing in different environments of the Andes to characterize the geographic range of *A. moltenii* and to assess whether this micromoth is able to use additional plants of the genus as hosts. Such a survey would be also a powerful tool to assess if additional species of *Adesmia*-feeding *Ypsolopha* are waiting to be discovered.

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